

**WHAT IS CLAIMED IS:**

1. A zero backflow vent assembly for a cryogen cooled superconducting magnet having a cryogen gas vent attached to the helium pressure vessel and connected to an exhaust vent comprising:

5 a valve in the cryogen gas vent interposed between the helium pressure vessel and the exhaust vent;

said valve opening in the event of an undesired pressure buildup in the helium pressure vessel and closing when the pressure inside the helium pressure vessel has subsided to safe levels.

10 2. The zero backflow vent assembly of claim 1 wherein the valve is comprised of a valve seat integrated with the vent assembly.

3. The zero backflow vent assembly of claim 2 wherein the valve is further comprised of:

a valve face;

15 means for alternately permitting the valve face to move towards the exhaust vent in the event of an undesired pressure buildup and to seal the valve face against the valve seat when the pressure inside the helium pressure vessel has subsided to safe levels.

20 4. The zero backflow vent assembly of claim 3 wherein a spring comprises the means for alternately permitting the valve face to move towards the exhaust vent in the event of an undesired pressure buildup and to seal the valve face against the valve seat when the pressure inside the helium pressure vessel has subsided to safe levels.

5. The zero backflow vent assembly of claim 4 wherein the spring is enclosed in a plunger assembly.

6. The zero backflow vent assembly of claim 5 wherein the spring is interposed between the spring backing plate and the back of the valve face.

5 7. The zero backflow vent assembly of claim 6 wherein the spring backing plate is attached to the cryogen gas vent using a threaded rod.

8. The zero backflow vent assembly of claim 7 wherein the threaded rod is threaded through a threaded aperture in the cryogen gas vent.

9. The zero backflow vent assembly of claim 8 wherein the length of the  
10 spring is adjustable by either moving the spring backing plate either closer to or further away from the valve face by threading or unthreading the threaded rod.

10. The zero backflow vent assembly of claim 9 wherein the cryogen gas vent has a spring recess area that partially surrounds the zero backflow vent assembly.

15 11. The zero backflow vent assembly of claim 10 wherein the zero backflow vent assembly is positioned downstream of a burst disk assembly.

12. A zero backflow vent assembly for a pressure relieving vent system for a cryogen cooled superconducting magnet having a cryogen gas vent attached to the cryostat and connected to an exhaust vent, said cryogen gas vent being installed  
20 to vent cryogen gas from the cryostat to the atmosphere in the event of an undesired pressure buildup comprising:

a spring loaded valve in the cryogen gas vent interposed between the pressure vessel and the exhaust vent;

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said valve opening in the event of an undesired pressure buildup in the pressure vessel and closing when the pressure inside the pressure vessel has subsided to safe levels.

13. The zero backflow vent assembly of claim 12 wherein the spring  
5 loaded valve is further comprised of a valve seat integrated with the cryogen gas vent.

14. The zero backflow vent assembly of claim 13 wherein the valve further comprises:

a valve face, said valve face being pressed against the valve seat during  
10 normal operation of the magnet;

said spring alternately permitting the valve face to move towards the exhaust vent in the event of an undesired pressure buildup and sealing the valve face against the valve seat when the pressure inside the pressure vessel has subsided to safe levels.

15. The zero backflow vent assembly of claim 14 wherein the spring is  
15 enclosed in a plunger assembly.

16. The zero backflow vent assembly of claim 15 wherein the spring is interposed between the spring backing plate and the back of the valve face.

17. The zero backflow vent assembly of claim 16 wherein the spring  
20 backing plate is attached to the cryogen gas vent using a threaded rod.

18. The zero backflow vent assembly of claim 17 wherein the threaded rod is threaded through a threaded aperture in the cryogen gas vent.

19. The zero backflow vent assembly of claim 18 wherein the length of the spring is adjustable by either moving the spring backing plate either closer to or further away from the valve face by threading or unthreading the threaded rod.

20. The zero backflow vent assembly of claim 19 wherein the cryogen gas  
5 vent has a spring recess area that partially surrounds the zero backflow vent assembly.

21. The zero backflow vent assembly of claim 20 wherein the zero backflow vent assembly is positioned downstream of a burst disk assembly.

22. A zero backflow vent assembly for a pressure relieving vent system for  
10 a cryogen cooled superconducting magnet having a cryogen gas vent attached to the cryostat and connected to an exhaust vent, said cryogen gas vent being installed to vent cryogen gas from the cryostat to the atmosphere in the event of an undesired pressure buildup comprising:

- a spring recess area within the cryogen gas vent;
- 15 a valve seat integrated with the cryogen gas vent opposite the spring recess area;
- a threaded aperture within the spring recess area opposite the cryogen gas vent;
- a threaded rod threaded into the threaded aperture;
- 20 a spring backing plate at the end of the threaded rod;
- a spring having a first end attached to the spring backing plate and a second end; and
- a valve face attached to the second end of the spring.

23. The zero backflow vent assembly of claim 22 wherein the spring alternately permits the valve face to move towards the exhaust vent in the event of an undesired pressure buildup and seals the valve face against the valve seat when the pressure inside the pressure vessel has subsided to safe levels.

5        24. The zero backflow vent assembly of claim 23 wherein the spring is enclosed in a plunger assembly.

25. The zero backflow vent assembly of claim 24 wherein the length of the spring is adjustable by either moving the spring backing plate either closer to or further away from the valve face by threading or unthreading the threaded rod.

10       26. The zero backflow vent assembly of claim 25 wherein the zero backflow vent assembly is positioned downstream of a burst disk assembly.